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EXAMINER	
PARKER, JOHN M	

ART UNIT	PAPER NUMBER
2823	

DATE MAILED: 04/21/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

H-A

Office Action Summary	Application No.	Applicant(s)	
	10/741,824	CHEN ET AL.	
	Examiner	Art Unit	
	John M. Parker	2823	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *19 December 2003*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-26* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-26* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *07 January 2005* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date *3/26/04*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Claim Objections

1. Claims 1,12, and 19 are objected to because of the following informalities: The term cyclical deposition process has a broader meaning than what is implied by the applicant. Cyclical can simply be interpreted as repeating the process with another wafer in the same chamber. Appropriate correction is required.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

2. Claims 1, 10-12, and 18 are rejected under 35 U.S.C. 102(e) as being anticipated by Wang et al. (US Pat. #6573179).

Regarding claim 1, Wang teaches a method for forming a cap layer, comprising:

depositing a barrier layer in a feature in a dielectric layer of a substrate[fig. 2, 210 and 202 respectively];

filling the feature with a metal-containing layer [fig. 2, 208];

planarizing the substrate [column 4, lines 14-21]; and

depositing a cap layer on the substrate by a cyclical deposition process [fig. 3, 220, it is inherent that this process will be repeated with additional wafers, therefor it is cyclical].

Regarding claim 10, Wang discloses the method of claim 1, wherein the cap layer has a thickness sufficient to block diffusion of metal atoms from the metal-containing layer [column 2, lines 61 and 62, the metal atoms are material of the interconnect].

Regarding claim 11, Wang discloses the method of claim 1, further comprising depositing an etch stop layer on the cap layer [fig. 4, 240].

Regarding claim 12, Wang teaches a method for processing a substrate, comprising:

depositing a barrier layer in a feature in a dielectric layer of a substrate [fig. 2, 210 and 202 respectively];

filling the feature with a metal-containing layer [fig. 2, 208];

planarizing the substrate [column 4, lines 14-21];

depositing a cap layer comprising tantalum nitride on the substrate by a cyclical deposition process [fig. 3, 220, it is inherent that this process will be repeated with additional wafers, therefor it is cyclical]; and

depositing an etch stop layer on the cap layer [fig. 4, 240].

Regarding claim 18, Wang discloses the method of claim 12, wherein the cap layer has a thickness sufficient to block diffusion of metal atoms from the metal-

containing layer [column 2, lines 61 and 62, the metal atoms are material of the interconnect].

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

3. Claims 2-9, 13-17 are rejected under 35 U.S.C. 103(a) as being unpatentable over Wang et al. (US Pat. #6573179) in view of Gates et al. (US Pat. #6203613).

Regarding claim 2, Wang teaches a refractory metal nitride cap layer [column 4, lines 58-61]. Wang fails to teach alternately pulsing a metal-containing compound and a nitrogen-containing compound to deposit the cap layer. However, Gates discloses forming a refractory metal nitride layer by just such a process [column 10, lines 25-52]

It would have been obvious to one of ordinary skill in the art to combine the teachings of Wang and Gates to enable the deposition step of forming a cap layer by alternately pulsing a metal-containing compound and a nitrogen-containing compound to be performed according to the teachings of Gates. One of ordinary skill in the art would have been motivated to look to analogous art teaching alternative suitable or useful methods of performing the disclosed method step of cap deposition, art recognized suitability for an intended purpose has been recognized to be motivation to combine. MPEP 2144.07.

Regarding claim 3, Wang in view of Gates discloses the method of claim 2, wherein the refractory metal nitride layer comprises tantalum nitride [Wang, column 5, line 9].

Regarding claim 4, Wang in view of Gates teaches the method of claim 2, wherein the pulsing is continued until the refractory metal nitride layer has a crystalline like structure over the metal-containing layer [Gates, column 7, lines 27-30 teaches that any desired thickness can be achieved repeating the deposition cycle, furthermore regarding the limitation that the layer is crystalline, this is an obvious outcome by depositing the layer by the same processes with the same parameters as the instant application].

Regarding claim 5, Wang in view of Gates teaches the method of claim 2, wherein the pulsing occurs at a pressure between about 0.5 Torr and about 5 Torr at a temperature between about 150.degree. C. and about 350.degree. C. [Gates, column 10, line 39 discloses a temperature in the range claimed]

Furthermore regarding the claimed pressure range one of ordinary skill in the art would have been led to the recited dimensions through routine experimentation and optimization. Applicant has not disclosed that the dimensions are for a particular unobvious purpose, produce an unexpected result, or are otherwise critical, and it appears prima facie that the process would possess utility using another dimension. Indeed, it has been held that mere dimensional limitations are prima facie obvious absent a disclosure that the limitations are for a particular unobvious purpose, produce an unexpected result, or are otherwise critical. See, for example, *In re Rose*, 220 F.2d

459, 105 USPQ 237 (CCPA 1955); *In re Rinehart*, 531 F.2d 1048, 189 USPQ 143 (CCPA 1976); *Gardner v. TEC Systems, Inc.*, 725 F.2d 1338, 220 USPQ 777 (Fed. Cir. 1984), cert. denied, 469 U.S. 830, 225 USPQ 232 (1984); *In re Dailey*, 357 F.2d 669, 149 USPQ 47 (CCPA 1966). See also MPEP 2144.04(IV)(B).

Regarding claim 6, Wang in view of Gates discloses the method of claim 2, wherein the pulsing is repeated until the cap layer has a thickness of about 10 angstroms [Gates, column 7, lines 26 and 27, the cycle is repeated until the desired thickness is reached].

With regards to the thickness of about 10 angstroms, Gates teaches that 167 cycles produces a TiN layer having a thickness of 50 angstroms [column 10, lines 46 and 47]. One of ordinary skill in the art would have been led to the recited dimensions through routine experimentation and optimization. Applicant has not disclosed that the dimensions are for a particular unobvious purpose, produce an unexpected result, or are otherwise critical, and it appears prima facie that the process would possess utility using another dimension. Indeed, it has been held that mere dimensional limitations are prima facie obvious absent a disclosure that the limitations are for a particular unobvious purpose, produce an unexpected result, or are otherwise critical. See, for example, *In re Rose*, 220 F.2d 459, 105 USPQ 237 (CCPA 1955); *In re Rinehart*, 531 F.2d 1048, 189 USPQ 143 (CCPA 1976); *Gardner v. TEC Systems, Inc.*, 725 F.2d 1338, 220 USPQ 777 (Fed. Cir. 1984), cert. denied, 469 U.S. 830, 225 USPQ 232 (1984); *In re Dailey*, 357 F.2d 669, 149 USPQ 47 (CCPA 1966). See also MPEP 2144.04(IV)(B).

Regarding claim 7, Wang in view of Gates teaches the method of claim 2, wherein the pulsing is repeated until the cap layer has a thickness of from about 5 angstroms to about 20 angstroms [Gates, column 7, lines 26 and 27, the cycle is repeated until the desired thickness is reached].

With regards to the thickness from about 5 angstroms to about 20 angstroms, Gates teaches that 167 cycles produces a TiN layer having a thickness of 50 angstroms [column 10, lines 46 and 47]. One of ordinary skill in the art would have been led to the recited dimensions through routine experimentation and optimization. Applicant has not disclosed that the dimensions are for a particular unobvious purpose, produce an unexpected result, or are otherwise critical, and it appears prima facie that the process would possess utility using another dimension. Indeed, it has been held that mere dimensional limitations are prima facie obvious absent a disclosure that the limitations are for a particular unobvious purpose, produce an unexpected result, or are otherwise critical. See, for example, *In re Rose*, 220 F.2d 459, 105 USPQ 237 (CCPA 1955); *In re Rinehart*, 531 F.2d 1048, 189 USPQ 143 (CCPA 1976); *Gardner v. TEC Systems, Inc.*, 725 F.2d 1338, 220 USPQ 777 (Fed. Cir. 1984), cert. denied, 469 U.S. 830, 225 USPQ 232 (1984); *In re Dailey*, 357 F.2d 669, 149 USPQ 47 (CCPA 1966). See also MPEP 2144.04(IV)(B).

Regarding claim 8, Wang in view of Gates discloses the method of claim 2, further comprising flowing a non-reactive gas continuously during the pulsing of the metal-containing compound and the pulsing of the nitrogen-containing compound [Gates, column 7, lines 10-20 teach a non-reactive gas purge between reactant pulses

but fails to disclose it as continuous. However, because this gas is inert it does not affect or change how the reactant gas deposits material on the surface. It has been held that "[v]arying the details of a process, as by adding a step or splitting one step into two does not avoid infringement, where the processes are substantially identical or equivalent in terms of function, manner, and result. *Universal Oil Products Co. v. Globe Oil and Refining Co.*, 322 U.S. 471, 61 USPQ 382 (1944); *Ace Patents Corporation v. Exhibit Supply Co.*, 119 F.2d 349, 48 USPQ 667 (7th Cir. 1941); *King-Seeley Thermos Co. v. Refrigerated Dispensers Inc.*, 354 F.2d 533, 148 USPQ 114 (10th Cir. 1965). Identity of the apparatus used for executing the processes is not material in itself. *National Lead Company v. Western Lead Products Co.*, 324 F.2d 539, 139 USPQ 324 (9th Cir. 1963)." Excerpt from *Matherson-Selig Co. v. Carl Gorr Color Card, Inc.*, 154 USPQ 265 (DC NIll 1967)].

Regarding claim 9, Wang in view of Gates teaches the method of claim 2, wherein the pulsing of the metal-containing compound and the pulsing of the nitrogen-containing compound are separated by a time delay [Gates, column 10, lines 40-45].

Regarding claim 13, Wang fails to teach alternately pulsing a tantalum-containing compound and a nitrogen-containing compound to deposit the cap layer. However, Gates discloses forming a refractory metal nitride layer by just such a process [column 10, lines 25-52]

It would have been obvious to one of ordinary skill in the art to combine the teachings of Wang and Gates to enable the deposition step of forming a cap layer by alternately pulsing a metal-containing compound and a nitrogen-containing compound

to be performed according to the teachings of Gates. One of ordinary skill in the art would have been motivated to look to analogous art teaching alternative suitable or useful methods of performing the disclosed method step of cap deposition, art recognized suitability for an intended purpose has been recognized to be motivation to combine. MPEP 2144.07.

Regarding claim 14, Wang in view of Gates discloses the method of claim 13, wherein the pulsing is continued until the cap layer has a crystalline like structure over the metal-containing layer [Gates, column 7, lines 27-30 teach that any desired thickness can be achieved repeating the deposition cycle, furthermore regarding the limitation that the layer is crystalline, this is an obvious outcome by depositing the layer by the same processes with the same parameters as the instant application].

Regarding claim 15, Wang in view of Gates teaches the method of claim 13, wherein each pulse is repeated until the cap layer has a thickness of from about 5 angstroms to about 20 angstroms [Gates, column 7, lines 26 and 27, the cycle is repeated until the desired thickness is reached].

With regards to the thickness from about 5 angstroms to about 20 angstroms, Gates teaches that 167 cycles produces a TiN layer having a thickness of 50 angstroms [column 10, lines 46 and 47]. One of ordinary skill in the art would have been led to the recited dimensions through routine experimentation and optimization. Applicant has not disclosed that the dimensions are for a particular unobvious purpose, produce an unexpected result, or are otherwise critical, and it appears prima facie that the process would possess utility using another dimension. Indeed, it has been held that mere

dimensional limitations are prima facie obvious absent a disclosure that the limitations are for a particular unobvious purpose, produce an unexpected result, or are otherwise critical. See, for example, *In re Rose*, 220 F.2d 459, 105 USPQ 237 (CCPA 1955); *In re Rinehart*, 531 F.2d 1048, 189 USPQ 143 (CCPA 1976); *Gardner v. TEC Systems, Inc.*, 725 F.2d 1338, 220 USPQ 777 (Fed. Cir. 1984), cert. denied, 469 U.S. 830, 225 USPQ 232 (1984); *In re Dailey*, 357 F.2d 669, 149 USPQ 47 (CCPA 1966). See also MPEP 2144.04(IV)(B).

Regarding claim 16, Wang in view of Gates discloses the method of claim 13, further comprising flowing a non-reactive gas continuously during the pulsing of the tantalum-containing compound and the pulsing of the nitrogen-containing compound [Gates, column 7, lines 10-20 teach a non-reactive gas purge between reactant pulses but fails to disclose it as continuous. However, because this gas is inert it does not affect or change how the reactant gas deposits material on the surface. It has been held that "[v]arying the details of a process, as by adding a step or splitting one step into two does not avoid infringement, where the processes are substantially identical or equivalent in terms of function, manner, and result. *Universal Oil Products Co. v. Globe Oil and Refining Co.*, 322 U.S. 471, 61 USPQ 382 (1944); *Ace Patents Corporation v. Exhibit Supply Co.*, 119 F.2d 349, 48 USPQ 667 (7th Cir. 1941); *King-Seeley Thermos Co. v. Refrigerated Dispensers Inc.*, 354 F.2d 533, 148 USPQ 114 (10th Cir. 1965). Identity of the apparatus used for executing the processes is not material in itself. *National Lead Company v. Western Lead Products Co.*, 324 F.2d 539, 139 USPQ 324

(9th Cir. 1963)." Excerpt from *Matherson-Selig Co. v. Carl Gorr Color Card, Inc.*, 154 USPQ 265 (DC NIll 1967)].

Regarding claim 17, Wang in view of Gates teaches the method of claim 13, wherein the pulsing of the tantalum-containing compound and the pulsing of the nitrogen-containing compound are separated by a time delay [Gates, column 10, lines 40-45].

4. Claims 19 and 26 are rejected under 35 U.S.C. 103(a) as being unpatentable over Naik et al. (US Pat. #6204168) in view of Yang et al. (US Pat. 6734559).

Regarding claim 19, Naik discloses a method of forming a dual damascene structure, comprising:

depositing a first dielectric film on a substrate [fig .1b, 102];

depositing an etch stop on the first dielectric film [fig. 1c, 104];

pattern etching the etch stop to define a vertical interconnect opening and expose the first dielectric film [fig. 1d, 106];

depositing a second dielectric film on the etch stop and the exposed first dielectric film [fig. 1e, 108];

pattern etching the second dielectric film to define a horizontal interconnect and continuing to etch the exposed first dielectric film to define the vertical interconnect [fig. 1h, 114];

depositing a metal-containing layer on the substrate to fill the vertical interconnect and the horizontal interconnect [fig. 2, 202];

planarizing the substrate [column 7, lines 15-18];

Naik fails to teach the use of a barrier layer on the substrate as well as a cap layer on the metal-containing layer or an etch stop thereon. However, Yang teaches such features

depositing a barrier layer on the substrate [fig. 3, 221];

depositing a cap layer on the substrate by a cyclical deposition process [fig. 5, 208, it is inherent that this process will be repeated with additional wafers, therefor it is cyclical]; and

depositing an etch stop layer on the cap layer [column 6, lines 6-9].

It would have been obvious to one of ordinary skill in the art at the time of the invention to incorporate the teachings of Yang into the method of Naik by depositing a barrier layer on the substrate, depositing a cap layer on the substrate and depositing an etch stop layer on the cap layer. The ordinary artisan would have been motivated to modify Naik in the manner set for the above for at least the purpose of having a barrier between the metal containing layer and the dielectric layers in the opening, having a cap layer to lower the diffusivity of copper and the electromigration resistance of the copper channels is improved (column 5, lines 63 and 64) and having an etch stop for protection when additional levels of channels and vias are created upon the first interconnect.

Regarding claim 26, Naik in view of Yang The method of claim 19, wherein the cap layer has a thickness sufficient to block diffusion of metal atoms from the metal-containing layer [Yang, column 3, lines 1-5].

5. Claims 20-25 are rejected under 35 U.S.C. 103(a) as being unpatentable over Naik et al. (US Pat. #6204168) in view of Yang et al. (US Pat. #6734559) as applied to claims 19 and 26 above, and further in view of Gates et al. (US Pat. #6203613).

Regarding claim 20,Naik in view of Yang teaches a refractory metal nitride cap layer [column 4, lines 38-41]. Naik in view of Yang fails to teach alternately pulsing a metal-containing compound and a nitrogen-containing compound to deposit the cap layer. However, Gates discloses forming a refractory metal nitride layer by just such a process [column 10, lines 25-52]

It would have been obvious to one of ordinary skill in the art to combine the teachings of Yang and Gates to enable the deposition step of forming a cap layer by alternately pulsing a metal-containing compound and a nitrogen-containing compound to be performed according to the teachings of Gates. One of ordinary skill in the art would have been motivated to look to analogous art teaching alternative suitable or useful methods of performing the disclosed method step of cap deposition, art recognized suitability for an intended purpose has been recognized to be motivation to combine. MPEP 2144.07.

Regarding claim 21, Naik in view of Yang further in view of Gates discloses the method of claim 20, wherein the refractory metal nitride layer comprises tantalum nitride [Yang, column 4, lines 38-41].

Regarding claim 22, Naik in view of Yang further in view of Gates teaches the method of claim 20, wherein the pulsing is continued until the refractory metal nitride layer has a crystalline like structure over the metal-containing layer [Gates, column 7,

lines 27-30 teaches that any desired thickness can be achieved repeating the deposition cycle, furthermore regarding the limitation that the layer is crystalline, this is an obvious outcome by depositing the layer by the same processes with the same parameters as the instant application].

Regarding claim 23, Naik in view of Yang further in view of Gates discloses the method of claim 20, wherein the pulsing is repeated until the cap layer has a thickness of from about 5 angstroms to about 20 angstroms [Gates, column 7, lines 26 and 27, the cycle is repeated until the desired thickness is reached].

With regards to the thickness from about 5 angstroms to about 20 angstroms, Gates teaches that 167 cycles produces a TiN layer having a thickness of 50 angstroms [column 10, lines 46 and 47]. One of ordinary skill in the art would have been led to the recited dimensions through routine experimentation and optimization. Applicant has not disclosed that the dimensions are for a particular unobvious purpose, produce an unexpected result, or are otherwise critical, and it appears prima facie that the process would possess utility using another dimension. Indeed, it has been held that mere dimensional limitations are prima facie obvious absent a disclosure that the limitations are for a particular unobvious purpose, produce an unexpected result, or are otherwise critical. See, for example, *In re Rose*, 220 F.2d 459, 105 USPQ 237 (CCPA 1955); *In re Rinehart*, 531 F.2d 1048, 189 USPQ 143 (CCPA 1976); *Gardner v. TEC Systems, Inc.*, 725 F.2d 1338, 220 USPQ 777 (Fed. Cir. 1984), cert. denied, 469 U.S. 830, 225 USPQ 232 (1984); *In re Dailey*, 357 F.2d 669, 149 USPQ 47 (CCPA 1966). See also MPEP 2144.04(IV)(B).

Regarding claim 24, Naik in view of Yang further in view of Gates teaches the method of claim 20, further comprising flowing a non-reactive gas continuously during the pulsing of the metal-containing compound and the pulsing of the nitrogen-containing compound [Gates, column 7, lines 10-20 teach a non-reactive gas purge between reactant pulses but fails to disclose it as continuous. However, because this gas is inert it does not affect or change how the reactant gas deposits material on the surface. It has been held that "[v]arying the details of a process, as by adding a step or splitting one step into two does not avoid infringement, where the processes are substantially identical or equivalent in terms of function, manner, and result. *Universal Oil Products Co. v. Globe Oil and Refining Co.*, 322 U.S. 471, 61 USPQ 382 (1944); *Ace Patents Corporation v. Exhibit Supply Co.*, 119 F.2d 349, 48 USPQ 667 (7th Cir. 1941); *King-Seeley Thermos Co. v. Refrigerated Dispensers Inc.*, 354 F.2d 533, 148 USPQ 114 (10th Cir. 1965). Identity of the apparatus used for executing the processes is not material in itself. *National Lead Company v. Western Lead Products Co.*, 324 F.2d 539, 139 USPQ 324 (9th Cir. 1963)." Excerpt from *Matherson-Selig Co. v. Carl Gorr Color Card, Inc.*, 154 USPQ 265 (DC NIII 1967)].

Regarding claim 25, Naik in view of Yang further in view of Gates discloses the method of claim 20, wherein the pulsing of the metal-containing compound and the pulsing of the nitrogen-containing compound are separated by a time delay [Gates, column 10, lines 40-45].

Conclusion

6. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. The additional cited art teaches similar structures to those instantly claimed.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to John M. Parker whose telephone number is 571-272-8794. The examiner can normally be reached on Monday - Friday 8am - 5pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Matthew S. Smith can be reached on 571-272-1907. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

John M. Parker

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